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IN THE MALE CHILD.

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POSITION OF THE EMPTY AND DISTENDED
BLADDER IN THE MALE CHILD.

THE following communication is intended as a contribution to our knowledge of the position of the bladder in the male child. The importance to the surgeon of correct ideas on this subject, more especially in connexion with catheterism and lithotomy, is very obvious. The special difficulties and dangers associated with the latter operation in children, on account of the anatomical peculiarities of the parts, are discussed by all writers on this subject. If, however, we refer to works on anatomy and surgery, the anatomical instruction we obtain is vague and unsatisfactory. We find it stated that the bladder in the infant is an abdominal rather than a pelvic organ, and that after birth it gradually descends into the pelvis, yet but little information will be gained as to the rate of its descent, and at what age it acquires the position characteristic of adult life. A few quotations will suffice to serve as examples of the way in which the subject is generally dismissed. Sir Henry Thompson¹ writes, "The bladder in children is an abdominal organ rather than a pelvic one." Spence,² "In performing the lateral operation on young children it is important to bear in mind that the bladder lies high." Quain,³ "In infancy the bladder is pyriform when distended and lies chiefly in the abdomen." More details are given by R. Harrison in his article on "The Urinary Bladder" in Todd's *Cyclopædia of Anatomy and Physiology*. He says, "In the foetus and infant of a year old the bladder in figure more resembles that of a quadruped; when distended, it is pyriform, like a bottle or a flask inverted, the larger end, or the superior fundus, being in the abdomen, and the smaller extremity tapering into the urethra. This is the only portion in the pelvis; at this age its vertical axis greatly exceeds its other diameters, and even when empty the greater portion of it is in the abdomen. As the child increases in

¹ *Lancet*, 8th March 1862, p. 246.

² *Lectures on Surgery*, 2nd ed., vol. ii. p. 1630.

³ *Elements of Anatomy*, 9th ed., vol. ii. p. 662.

years and size, its pelvis expands, the bladder gradually ascends into this region, and in the same proportion its lower fundus enlarges, so that at about six or seven years of age it presents a more oval form, both extremities being nearly equal, and very little of it rising above the pubes, unless when distended. From this period it continues to acquire gradually the adult figure, that is, its inferior fundus and body enlarge, while the superior remains stationary; hence it becomes shorter in its proportions, and broader below, so as to assume the triangular shape when empty, and the ovoid when distended."

Drawings in illustration of this subject are even more defective than the verbal descriptions. Notwithstanding the numerous and valuable works that have been published of late years on topographical and surgical anatomy, there are no accurate drawings of frozen mesial sections of the male pelvis between infancy and adult life. Rüdinger,¹ in a sagittal mesial section of a new-born infant, gives an excellent representation of the position of the bladder, and Henle² also figures a section of a male pelvis at the same age. Jarjavay³ represents a mesial section of the pelvis of an infant three months old.

There are very few mesial sections of the male pelvis in children above this age, and those that have been published are of little value. J. Houston⁴ has a mesial section of the pelvis of a male child aged two years; but the method of preparation, which consisted in the removal of the pelvis, the distension of bladder and rectum with spirit, and cutting a section after hardening in this fluid, renders it of little use in determining the position of the bladder. Pirogoff⁵ gives a sagittal section of a male child aged ten years; but the drawing is very rough, and the bladder, urethra, and anus do not appear to have been opened. He gives a better view of a section of the pelvis of a lad aged 17, but even here the position of the anus is not shown.

There can be no doubt but that sections of the frozen cadaver are the best means at our disposal for the accurate determination of the position and relations of parts one to another, and so far as the bladder is concerned there are no reasons to suppose that it alters its position, in any essential respect, after death.

In the course of an investigation into the topographical anatomy of the child, I have made several sections of the male bladder, which I trust will prove not only interesting to the anatomist, but also useful to the practical surgeon. The specimens I intend specially to describe in this paper are four mesial sections of children, all of whom were almost exactly the same height, thirty-

¹ *Topographisch-chirurgische Anatomie des Menschen*, iv. Abtheilung, Tafel xi.

² *Handbuch der Anatomie des Menschen*, fig. 131.

³ *Recherches Anatomiques sur l'Urètre de l'Homme*, plate iv. fig. 2.

⁴ *Views of the Pelvis, etc.* Dublin, 1829.

⁵ *Anatome Topographica*. Petropoli, 1859.

nine inches, and about the same age, five and six years. In all these cases the entire body was frozen. In two of them vertical mesial sections were made of the whole trunk, in the others transverse sections were made at the level of the umbilicus, and the pelvis were divided by mesial sections. In two of them the bladder was empty and contracted, in the other two it was distended with water.

Believing that illustrations of such sections are calculated to give a much clearer idea of the position of the bladder than can be obtained from written descriptions and tables of measurements, I have had prepared drawings of two of the specimens, one with the bladder empty, and the other with it distended (see Plates, Figs. 1 and 2). The figures are life size, and made from tracings taken from the sections while frozen. The coils of intestines, which were above the bladder and rectum, have not been represented.

Position of Empty Bladder.—This is shown in Fig. 1, which gives a view of a mesial section of a child aged five years. In this case the whole body was divided in the same plane. The bladder contained only a few drops of frozen urine and was firmly contracted. It will be seen to be situated behind the upper half of the pubic symphysis. A straight line from the upper edge of the symphysis to the tip of the coccyx passed just below the orifice of the urethra, and one from the same point in front, backwards to the juncture of the third and fourth pieces of the sacrum, nearly corresponded to the upper surface of the bladder. The prostatic part of the urethra was 13 mm. in length, and the membranes 5 mm., and the vesical orifice of the urethra was 20 mm. above the level of the lowest part of the bulbous portion of the urethra. The cavity of the bladder was triangular on section, one angle was directed forwards, another backwards, and the third, corresponding to the opening into the urethra, downwards. The rectum was empty. The other specimen with the bladder empty and contracted was from a child of the same age and height, but rather stouter. The bladder had practically a similar position and shape to that in Fig. 1, but it was quite empty, and the upper surface of the bladder was more convex.

In Fig. 1 the peritoneum lined the anterior abdominal wall down to the upper border of the pubic symphysis, and at this point it turned backwards, covering the upper surface of the bladder. At the juncture of the superior and posterior surfaces it formed a free fold, and then descended between the bladder and rectum to within 4 cm. of the anus. The peritoneum in the other specimen extended downwards in front slightly behind the symphysis; but it did not reach so low behind the bladder, and the distance from the very shallow recto-vesical pouch to the anus was 5.2 cm. In this case there was a fold of the peritoneum like that shown in Fig. 1, but a little longer. I have always found one or more

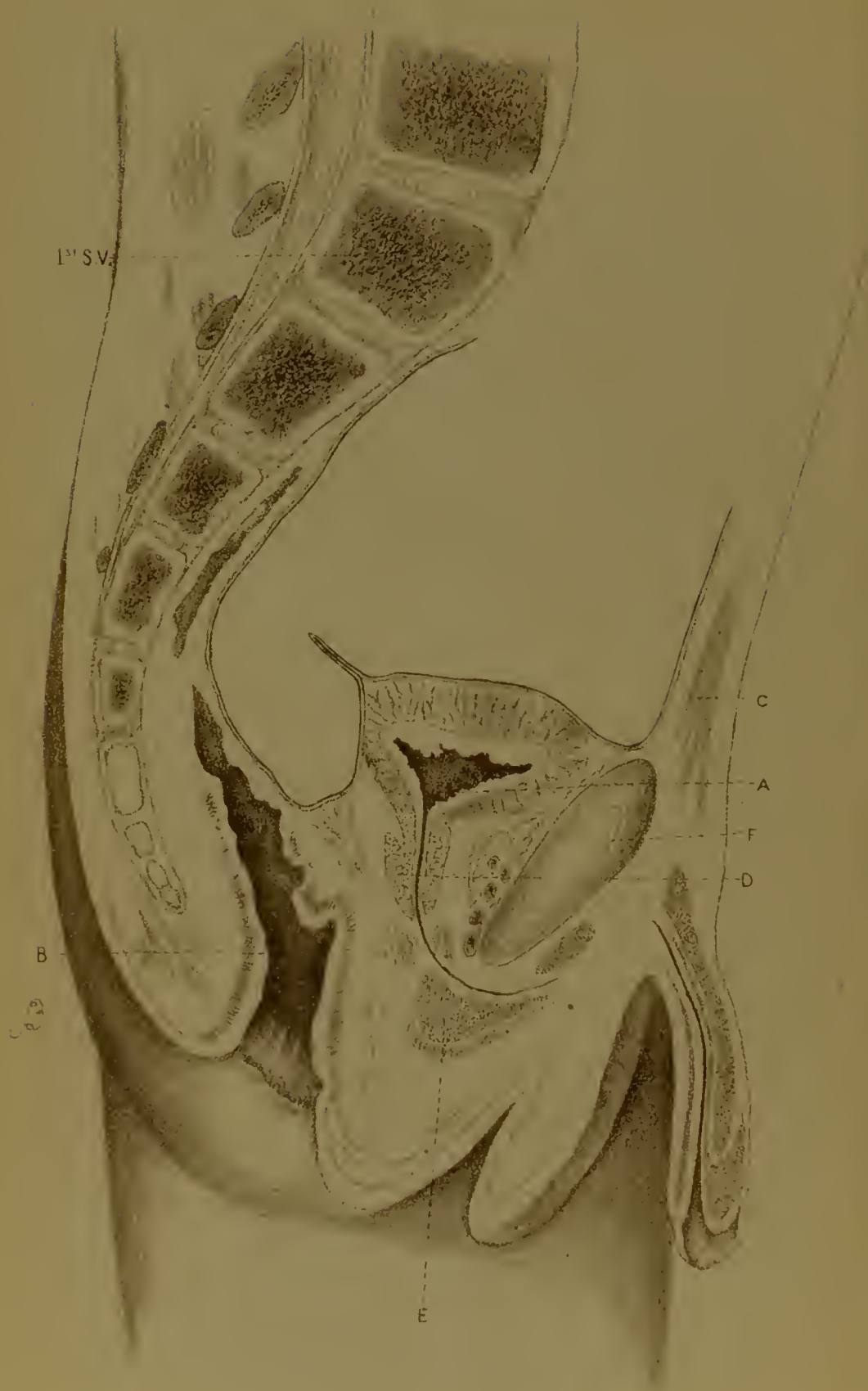
folds of this kind in cases where the bladder was empty and contracted; but I have not seen any references to them. They will gradually be obliterated as the bladder becomes distended with urine.

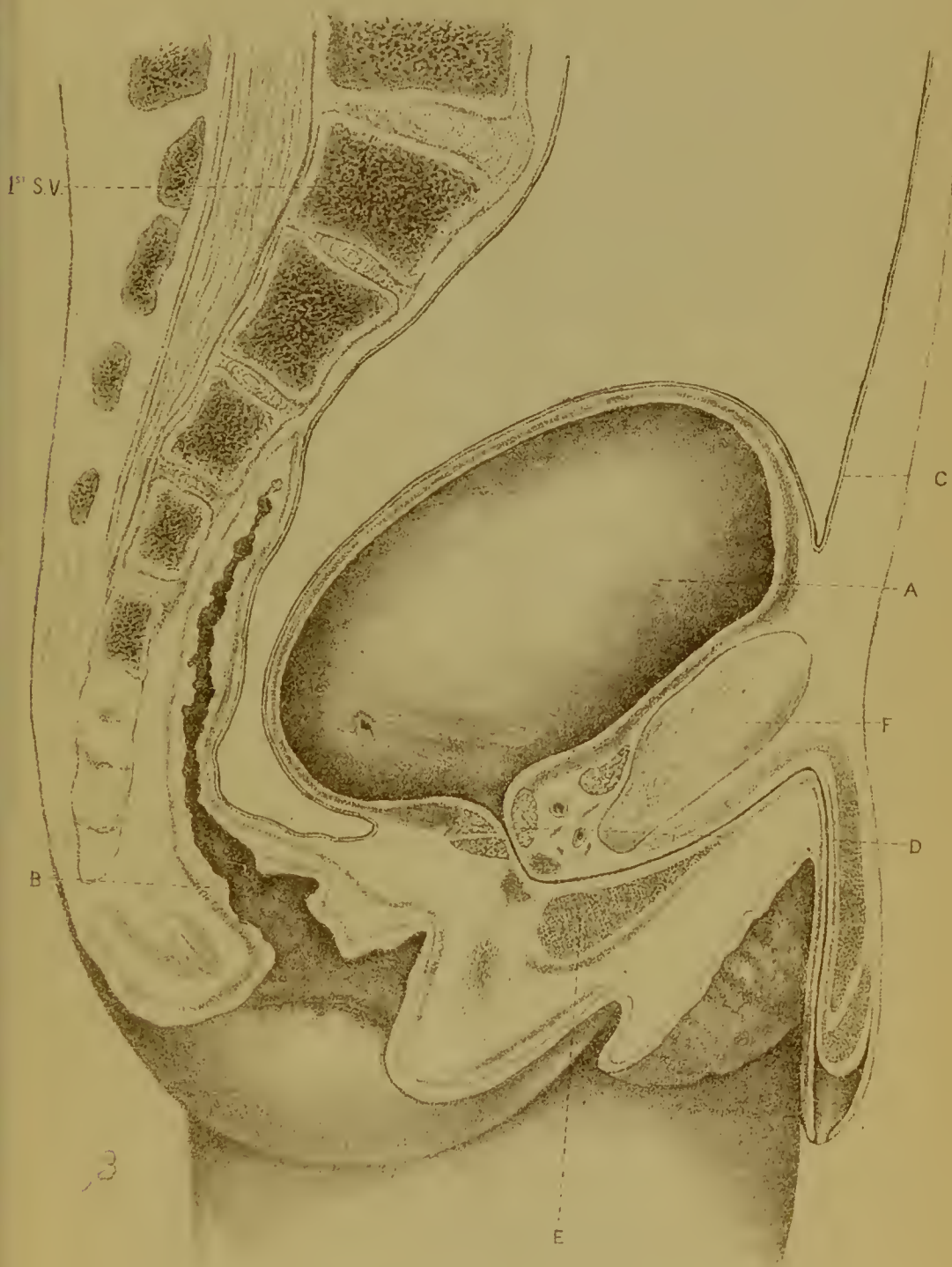
It is difficult to make a satisfactory comparison between the position of the bladder in these two cases, and that which it occupies *under similar conditions* in the adult, on account of its usual position in the latter not having been determined. Almost all the mesial sections of the adult male pelvis that have been published are from cases in which the bladder was more or less distended. Jarjavay,¹ plate vi., gives a section with the bladder empty and contracted, in which it is lower in the pelvis than in my specimens; but it looks very much as though it had been allowed to fall downwards and backwards before it was drawn.

Position of Distended Bladder.—The positions and relations of a distended bladder are seen in Fig. 2, which represents a section of a child about six years old. The whole trunk was divided by a mesial section. Before freezing about two ounces of water was slowly injected into the bladder. A comparison of the two specimens demonstrates clearly that the bladder has not only risen into the abdomen, but has also pushed its way down towards the perinæum, and that this has been accompanied by a marked shortening of the length of the prostatic portion of the urethra. This was 7 mm. in length as compared with 13 mm. in the other case. The vesical orifice of the urethra was 10 mm. above the lowest part of the bulbous portion of the urethra, while in the specimen with the bladder empty it was 20 mm. Again the distance of the urethral orifice from the anus in Fig. 1 was 4 cm., in Fig. 2 about 3 cm. The peritoneum was reflected from the abdominal wall on to the bladder 8 mm. above the pubic symphysis, and the very deep recto-vesical pouch reached to within 18 mm. of the anus. In this child the lower half of this pouch was occupied by serous fluid.

In another male child, about five years old, I injected three ounces of water into the bladder before freezing. In this case the descent of the bladder towards the perinæum, and the shortening of the prostatic part of the urethra, although distinct, was not so marked as in the former case. The length of the prostatic part of the urethra was 10 mm., and the internal orifice of the urethra was 17 mm. above the level of the lowest part of the bulbous portion of the urethra. There was a marked difference in the position of the part of the bladder lying behind the urethral orifice in the two cases with the bladder distended. In the one represented in Fig. 2, this part of the bladder wall passed nearly horizontally backwards for about 2 cm. before it began to turn upwards. In the other case the lower end of the bladder was not so large, and the part behind the urethral orifice passed directly upwards and backwards. In this

¹ *Op. cit.*





case the bladder reached as high as the base of the sacrum. The peritoneum was reflected from the anterior abdominal wall on to the bladder 2·7 cm. above the symphysis pubis. The lower end of the recto-vesical pouch of peritoneum was much higher than in the other case, being 4·3 cm. above the anus.

With regard to the differences in position of the two distended bladders, I think it may be partly attributed to variations in the shape and position of the coccyx. In the specimen shown in Fig. 2 the coccyx is directed downwards and slightly backwards, while in the other specimen it curved somewhat forwards. In the latter case it would give more support to the posterior part of the pelvic floor. As the bladder is gradually distended it will naturally tend to extend in the direction of least resistance, and the descent of the fundus of the bladder in the one case may have been due to a weakness of the pelvic floor.

Garson¹ investigated, in the Anatomical Institute at Leipzig, the "Displacement of the Bladder and Peritoneum in the Male by Distension of the Rectum." He showed that by distension of the rectum the bladder was pushed up towards the abdomen, the prostatic and membranous portions of the urethra being stretched, the former to about double its normal length. Since then several surgeons (Petersen, Ferrier, etc.) have advocated and employed distension of the rectum in order to raise the bladder before performing supra-pubic lithotomy. We usually think of the bladder during distension as simply rising into the abdomen, and but little attention appears to have been paid to the possibility of its passing also towards the perinæum and diminishing the length of the prostatic part of the urethra. The only reference to this subject that I have noticed in anatomical works is in Rüdinger's *Supplement zur Topographisch-chirurgischen Anatomie des Menschen*, 1879. In plate iii. he figures a mesial section of a male body in which the bladder was greatly distended. In the explanation of this plate he directs attention to the low position of the base of the bladder. The plate also shows very distinctly a marked shortening of the prostatic and membranous portions of the urethra. This subject is obviously worthy of more attention than it has yet received.

EXPLANATION OF PLATES.

FIGURE 1. Mesial section of pelvis of boy aged 5 years. Bladder nearly empty and contracted.

FIGURE 2. Mesial section of pelvis of boy about 6 years old. Bladder distended with two ounces of water.

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| A. Bladder. | D. Prostate. |
| B. Rectum. | E. Bulb. |
| C. Peritoneum. | F. Pubic symphysis. |

¹ *Edin. Med. Journal*, Oct. 1878.

